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eggs often occur on the surface of the testes; so that here there is a rudimentary hermaphroditism, the structural arrangement, however, not permitting self-fertilization.—Whether the shells of Planorbis are dextral or sinistral, Mr. R. E. C. Stearns discusses in a very interesting and suggestive paper in the Proceedings of the Academy of Natural Sciences, of Philadelphia. He believes that they are sinistral. The variations in the shells of certain species are then described in a way to be of much value from an evolutionary standpoint.—The publication of the Bulletin of the Buffalo Society of Natural Sciences has been resumed by the issue of the first number of Volume IV, the most interesting article in which is Mr. E. E. Fish's on the imitative and ventriloquial power of birds, containing original observations of merit.—A third paper on American spiders, by Count Keyserling, appears in Verhandlungen der K. K. Zoöl.-bot. Gesellschaft in Wien. Among the new species are *Epeira cavatica* from caves in Kentucky, and *Celotes juvenilis* from Mammoth cave.—We glean the following notes from the Proceedings of the U. S. National Museum, June–August: Capt. Bendire has shown that the supposed land-locked little red salmon (*Oncorhynchus kennerlyi*) of the Upper Columbia, is nothing but the young breeding male or grilse of *Oncorhynchus nerka*.—The genera and species of the family Centrarchidæ are reviewed by Mr. C. L. McKay. The detailed review of the genus Centurus will interest ornithologists, while there are several descriptive ichthyological papers by Bean, Jordan, Lockington, Rosa Smith and Gill.

ENTOMOLOGY.¹

NOTES ON HYDROPHILUS TRIANGULARIS.—The article by Mr. Garman in the August number has provoked an inquiry as to the appearance of the water beetle there referred to. The accompanying illustration (Fig. 1, *b*) will, we believe, convey the desired information even better than could words.

Having, in 1876, reared *Hydrophilus triangularis* from the egg to the perfect state, and made a number of notes upon it, we would take this occasion to supplement Mr. Garman's article with a few facts that may interest the general reader. The asymmetry in the jaws, noted by Mr. Garman, is constant so far as we have observed, and is, in fact, quite common in Carabidæ generally. The egg-case of *H. triangularis*, described by Mr. Garman, differs materially from that of the European *H. piceus*, according to descriptions of this last. We found the former to consist virtually of three distinct parts, and the subsidiary figure (2) will, perhaps, more fully indicate these parts than did Mr. Garman's outlines. There is, *first*, what may be called the floater (Fig. 2, *c*), which

¹ This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

itself is composed of two parts, viz: (1) a hard spatulate piece of compact brown silk, smooth externally and with the two edges of the tapering end curled inside and welded at tip so as to form a

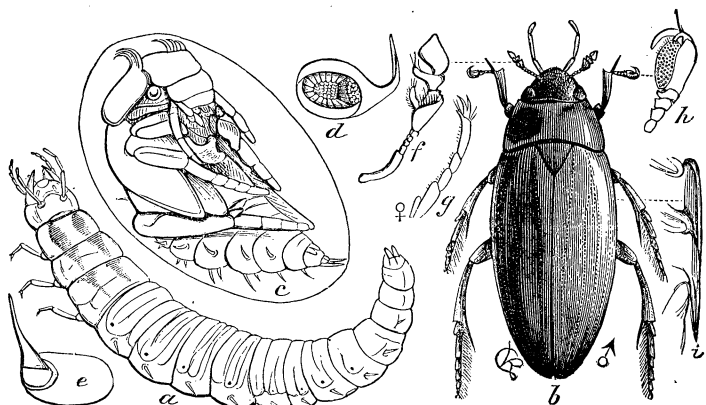


FIG. 1.—*Hydrophilus*: *a*, larva of *H. piceus*; *c*, pupa of same; *d*, opened egg-case showing arrangement of eggs; *e*, closed do; after Blanchard; *b*, ♂ of *H. triangularis*; *f*, antenna of same; *g*, front tarsus ♀; *h*, do of ♂; *i*, stout sternal spine, side view; after Riley.

stout point (Fig. 2, *g*), and (2) a somewhat cuneiform air-chamber (Fig. 2, *d, h*). There is, *second*, the egg-case proper (Fig. 2, *i*), and, *third*, the outer bag or covering (Fig. 2, *f, k*). The air-chamber has an external, slightly bulging covering (*d*) of the same character as the outer bag of which it forms a part, but of somewhat darker silk, while the inside (*h*) consists of loose brown silk forming large cells and connecting with the spine, the hollow parts of which are in fact filled more or less compactly with these

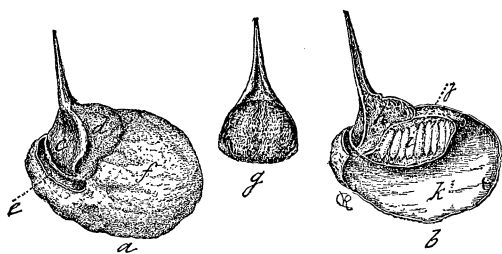


FIG. 2.—Egg-case of *Hydrophilus triangularis*: *a*, full side view; *c*, floater; *d*, air-chamber; *f*, outer bag; *e*, opening; *g*, floater detached, showing inner side; *b*, ideal sectional view of *a*, showing the three divisions of air chamber (*h*), egg-case proper (*i*) and outer bag (*k*)—after Riley.

silken fibers. The egg-case proper, which is of a white, rather flimsy or paper-like silk is partially suspended posteriorly from the roof of the outer bag by white loose silk, but is principally attached to the inferior side of the air-chamber, which so narrows toward the broad end of the spatulate piece that this last is vir-

tually attached to the anterior part of the egg-case, its attachment to the outer bag being so slight as to admit of the frontal rent (Fig. 2, *e*).

The young larvæ generally break through the back part of the egg-case proper and remain for a day or two, and until they have visibly increased in size, within the outer bag, issuing finally through the frontal rent through which the water is easily admitted. When floating freely the floater is always mostly out of water, the point upward and obliquing slightly forward. The eggs are thus bathed in water but freely aerated. The spike seems to be essential to their well-being, as Mr. A. G. Laker¹ found that those of *H. piceus* failed to hatch when it was cut off, yet the somewhat similar case of the common *Hydrobius fuscipes* has no such point, but in its place the silk is extended from beneath the leaf to which the case is attached to the upper surface over which it is spread, and according to Mr. Laker they will hatch if kept entirely under water.

We conclude that the curious contrivance in *Hydrophilus* is intended not only to secure an ample supply of air to the eggs and to protect them, but also to protect the newly hatched young from their numerous enemies until their jaws have strengthened and they are better able to begin the struggle for existence.

We have often been curious to know whether or not the sternal spine of the beetle was used to form the point of the floater. It seems useful for such a purpose and yet occurs in both sexes. If any of the readers of the NATURALIST have ever observed the formation of this curious egg-case, we shall be glad to have the process described.

The larva loses its hairiness after the first molt, and the mature larva differs from the young larva principally in the relatively shorter legs and mouth-parts. We were struck with the ravenousness and rapid growth of this larva, those hatching on the 26th of July having passed through the first molt on the 30th of the same month, and through a second molt on the 3d of August. The larva of *H. piceus* is said by European writers to pass through three molts, but we observed only two in our larvæ. They were full grown a week later, and by the 5th of September the first one had gone through its transformations, and issued as a beetle. The molt takes place in all sorts of situations, and even while the larva is floating on the surface of the water. The color becomes paler toward each molt but dark afterwards, the characteristic dark and sordid-white mottlings, especially the wavy lines along the back, being most conspicuous just after the molt. They fed on everything with which they came in contact, as young Ephemerid and Libellulid larvæ, other aquatic animals, and even raw beef which we gave them.

The pupa, which was readily formed in a large flower pot filled

¹ *The Entomologist* (London, Eng.), XIV, p. 83

with earth kept well moistened, closely resembles that of *H. piceus* of Europe, so that the figure of that species here given (Fig. 1, c) will very well illustrate its appearance. The anal appendages are much longer in our species, very stout and parallel in their basal third, thence suddenly narrowed and slightly divergent. They are annulated and their length seems to vary according to the specimens. In the middle of the anal joint there is ventrally a triangular tubercle, and on the apical margin of the penultimate joint are two more prominent, connected, cone-like protuberances. The anal joint dorsally terminates in two stout, short tubercles, each bearing a spine. The pupa is chiefly characterized by the sternal process or spine, and by having on each abdominal joint behind each spiracle, a filamentous, curved, tapering process, minutely annulate and with a seta issuing from tip. On each side of the anterior border of the prothorax is a set of three of these processes largely developed. Their function has not been critically studied, but they undoubtedly act as secondary tracheæ.—*C. V. Riley.*

THE CULTIVATION OF PYRETHRUM AND MANUFACTURE OF THE POWDER.¹—2. *Application of Pyrethrum in Fumes.*—The powder burns freely giving off considerable smoke and an odor which is not unpleasant. It will burn more slowly when made into cones by wetting and molding. In a closed room the fumes from a small quantity will soon kill or render inactive ordinary flies and mosquitoes, and will be found a most convenient protection against these last where no bars are available. A series of experiments made under our direction, indicates that the fumes affect all insects, but most quickly those of soft and delicate structure.

This method is impracticable on a large scale in the field, but will be found very effective against insects infesting furs, feathers, herbaria, books, etc. Such can easily be got rid of by enclosing the infested objects in a tight box or case and then fumigating them. This method will also prove useful in greenhouses, and, with suitable instruments we see no reason why it should not be applied to underground pests that attack the roots of plants.

3. *Alcoholic Extract of Pyrethrum powder.*—The extract is easily obtained by taking a flask fitted with a cork and a long and vertical glass tube. Into this flask the alcohol and Pyrethrum are introduced and heated over a steam tank or other apparatus. The distillate, condensing in the vertical tube, runs back, and, at the end of an hour or two the alcohol may be drained off and the extract is ready for use. Another method of obtaining the extract is by repercolation after the manner prescribed in the American Pharmacopœia. The former method seems to more thoroughly extract the oil than the latter; at least we found that the residuum of a quantity of Pyrethrum from which the extract was obtained by repercolation had not lost a great deal of its power. The first

¹ Concluded from September number.

method is apparently more expensive than the other, but the extract is in either case more expensive than the other preparations, though very conveniently preserved and handled.

The extract may be greatly diluted with water and then applied by means of any atomizer. Professor E. A. Smith of Tuscaloosa, Ala., found that, diluted with water, at the rate of one part of the extract to 15 of water, and sprayed on the leaves, it kills cotton worms that have come in contact with the solution in a few minutes. The mixture in the proportion of one part of the extract to 20 parts of water was equally efficacious, and even at the rate of 1 to 40 it killed two-thirds of the worms upon which it was sprayed in 15 or 20 minutes, and the remainder were subsequently disabled. In still weaker solution or at the rate of 1 to 50 it loses in efficacy, but still kills some of the worms and disables others. Professor Smith experimented with the extract obtained by distillation, and another series of experiments with the same method was carried on last year by Professor R. W. Jones of Oxford, Miss.¹ He diluted his extract with twenty times its volume of water and applied it by means of an atomizer on the cotton worm and the boll worm with perfect success. Mr. E. A. Schwarz tried, last summer, the extract obtained by repercolation² and found that 10 drachms of the extract, stirred up in two gallons of water and applied by means of Whitman's fountain pump was sufficient to kill all cotton worms on the plants. Four drachms of the extract to the same amount of water was sufficient to kill the very young worms.

4. *Pyrethrum in simple water solution.*—So far as our experiments go, this method is by far the simplest, most economical and efficient. The bulk of the powder is most easily dissolved in water, to which it at once imparts the insecticide power. No constant stirring is necessary and the liquid is to be applied in the same manner as the diluted extract. The finer the spray in which the fluid is applied the more economical is its use and the greater the chance of reaching every insect on the plant. Experiments with Pyrethrum in this form show that 200 grains of the powder stirred up in two gallons of water is amply sufficient to kill the cotton worms, except a very few full-grown ones, but that the same mixture is not sufficiently strong for many other insects as the boll worm, the larva of the *Terias nicippe* and such species as are protected by dense, long hairs. Young cotton worms can be killed by 25 grains of the powder stirred up in two quarts of water.

The Pyrethrum water is most efficacious when first made and loses power the longer it is kept. The powder gives the water a light greenish color which, after several hours, changes to a

¹ Vide *American Entomologist*, Vol. III, pp. 252-3.

² From one pound of the powder one pint of extract was made, each drop of the extract representing one grain of the powder. The actual cost of making the extract was 50 cents.

light brown. On the third day a luxuriant growth of fungus generally develops in the vessel containing the liquid, and its efficacy is then considerably lessened.

5. *The Tea or Decoction*.—Professor E. W. Hilgard of Berkeley, Cal., is the only one who has experimented with Pyrethrum in this form and expresses himself most favorably as to the result. He says:

"I think, from my experiments, that the *tea or infusion, prepared from the flowers* (which need not be ground up for the purpose) is the most convenient and efficacious form of using this insecticide in the open air; provided that it is *used at times when the water will not evaporate too rapidly*, and that it is applied, not by pouring over in a stream, or even in drops, but *in the form of a spray from a syringe with fine holes* in its rose. In this case, the fluid will reach the insect despite of its water-shedding surfaces, hairs, etc., and stay long enough to kill. Thus applied, I have found it to be efficient even against the armored scale-bug of the orange and lemon, which falls off in the course of two or three days after the application, while the young brood is almost instantly destroyed. As the flower tea, unlike whale soap and other washes, leaves the leaves perfectly clean, and does not injure even the most tender growth, it is preferable on that score alone; and in the future it can hardly fail also to be the cheaper of the two. This is the more likely, as the tea made of the leaves and stems has similar, although considerably weaker, effects; and if the farmer or fruit grower were to grow the plants, he would save all the expense of harvesting and grinding the flower-heads, by simply using the header, curing the upper stems, leaves, and flower-heads all together, as he would hops, making the tea of this material by the hogshead, and distributing it from a cart through a syringe. It should be diligently kept in mind, that the least amount of *boiling* will seriously injure the strength of this tea, which should be *made with briskly boiling water*, but then simply covered over closely, so as to allow of as little evaporation as possible. The details of its most economical and effectual use on the large scale remains, of course, to be worked out by practice."

The method of applying Pyrethrum in either of the three last-mentioned forms is evidently far more economical in the open field and on a large scale than the application of the dry powder, and, moreover, gives us more chance of reaching every insect living upon the plant to which the fluid is applied. The relative merits of the three methods can be established only by future experience.

MIGRATION OF PLANT LICE FROM ONE PLANT TO ANOTHER.—M. J. Lichtenstein of Montpellier, France, whose important entomological writings are known here as well as in his own country, has been appointed by his Government to especially study all questions relating to the habits of the Aphididæ. M. Lichtenstein has for some years fully believed that most of our Aphids, and especially the gall-making *Pemphigini*, habitually migrate, in the winged, parthenogenic, female form, from one plant to another, and that the species must necessarily inhabit two different plants before it passes through its full cycle of development. That it is the rule for most of the insects of this family to so migrate is evident from the fact, patent to all who have observed them, that there is a period in mid-summer when most of the species abandon the plants which they so seriously affect in spring and early summer. This disappearance, emphasized already in 1829, by Joshua Major, in

treating of the apple tree plant louse,¹ has usually been attributed to natural enemies of the Aphids, but these play only a part in causing it. The fact of migration rests, moreover, on repeated direct observations, and all spring gall-inhabiting species have usually vacated their galls by mid-summer. The air has often been seen to swarm with Aphids, and Reaumur observes that in migrating they sometimes actually darken the air. In fact it is now coming to be well understood, that in this family the habit of the same species in spring is quite different to its habit in the fall, and that in the study of the insects of this family there is opened up to us a new and interesting field for observation comparable to that of late years developed by the discovery of dimorphism in the *Cynipidæ*. We have for some time since recognized this fact of migration, but have been led to believe from the known facts in the case that the migration was necessarily from one plant to another of the same *genus*. M. Lichtenstein, on the contrary, believes that the change is still more wonderful and that many tree-inhabiting and gall-making species actually have a mid-summer life on the roots of grasses and herbaceous plants. He has recently communicated to us some discoveries that certainly justify his views. In the genuine *Aphidini* he has ascertained that *Aphis* (*Phorodon*) *humuli* migrates from *Prunus* to *Humulus*, and that *Aphis* (*Myzus*) *asclepiadis* Passerini (*nerii* Boyé) migrates from *Asclepias* to *Nerium*.

THE CHINCH BUG.—The connection of meteorological conditions, especially the amount of rain-fall, with the increase or decrease of this notorious pest has long been recognized by entomological writers. From a *résumé* of the chronological history of bad chinch bug years and the effect which temperature may have on the insect, Professor Cyrus Thomas showed a year ago (*American Entomologist*, Oct., 1880) that the insect would probably be bad in 1881. How disastrous it really has been in the Western States, especially in Kansas, may be gathered from the fact that a chinch bug convention, the first ever held in the U. S., was held recently at Windsor, Kansas. A large number of farmers participated in the discussion, and a resolution to exclude wheat from the growing crops was unanimously adopted—the length of time not being mentioned. It is understood, however, that the planting will be resumed at the earliest possible practicable period. Anticipating that this would be a bad chinch bug year, Professor Thomas recommended the sowing of a larger area of oats, and had this advice been more generally adopted it would have been of great benefit to the farmers of that region. The insect has been quite common in all parts of the country the present year. It attacked and injured, during the month of August, the rice fields in the vicinity of Savannah, Ga., and was noticed in July in great

¹ Treatise on Insects most prevalent on Fruit Trees and Garden Produce. London, England, 1829.

numbers on "sand-oats" and other grasses growing on the dunes at Fortress Monroe, Va.

PHYLLOXERA LAWS.—The existing laws regulating the traffic in plants with a view of preventing the introduction of the Grape Phylloxera, are thus summarized in the annual report of the Syndical Chamber of Nurserymen at Ghent.

"Introduction of living plants is wholly forbidden in Italy, Spain, Turkey, Roumania, Algeria, Cape of Good Hope.

"Introduction of living plants is permitted as usual, except in the case of vines, which are prohibited—Germany.

"Introduction of living plants packed as usual, is permitted, but with a certificate of origin, in Switzerland; and a similar certificate attested by a consul in Austria-Hungary.

"Introduction under ordinary conditions if provided with a consular certificate, *viséed*, is allowed in Portugal and its colonies."

ONE HALF THE VINE AREA OF FRANCE AFFECTED BY PHYLLOXERA.—The British Consul at Bordeaux, in a recent report, states that of the 2,200,000 hectares [one hectare = $2\frac{1}{2}$ acres nearly] of vineyards in France, about 500,000, or nearly one-fourth are destroyed by the grape Phylloxera, while as many more are attacked. He states that the only sure remedy is submersion, which is resorted to with invariable success wherever possible. The only available preventive is by the use of our resisting American stocks.

LONDON PURPLE AND PARIS GREEN.—Professor C. E. Thorne, of the Ohio State University, has found by experience, during the past two years, that weight for weight London purple is more efficacious than Paris green as an insecticide. There is really no need of using it weight for weight, as one half a pound of the purple goes as far as one pound of the green and costs very much less. Though from the cheapness of the former there is less temptation to adulterate it than with the latter, yet there are still cheaper powders with which it may be and has been adulterated. If not carefully ground it is less effectual and apt to form lumps in mixing with water. Hemingway & Co., of New York, the originators of this insecticide, are taking particular pains to grind finely, experience having taught that increased care is warranted in the increased satisfaction which their article gives. Another purple poison is now being advertised as Paris purple. The base is a purple refuse obtained by A. Pourrier, of Paris, extensively used for coloring sugar paper, for the very reason that there is no arsenic or other poison in it. But as it costs but \$1.75 per ton in Paris, enterprising parties are using it in imitation of London purple by adding the arsenic to it.

ENTOMOLOGIST FOR THE PACIFIC COAST.—At the recent well-attended meeting of the California Viticultural Commission, the desirability of having a state entomologist was discussed, and a

report submitted of the efforts hitherto made to create a chair of entomology in the State university. The people of the Pacific coast are evidently alive to the importance of studying their insect enemies, and we may expect soon to see some definite action taken by the State government.

DILAR IN NORTH AMERICA.—Mr. R. McLachlan describes in the August number of the *Entomologist's Monthly Magazine* (p. 55), under the name of *Dilar americanus*, the first species of this very singular (Neuropterous) genus known from North America. The typical specimen (a female) was collected by Mr. F. G. Sanborn at Bee Spring, Ky., in June, 1874.

LOCUSTS IN NEVADA.—The *Reno* (Nevada) *Journal* reports that the countless locusts that hatched in Western Nevada this spring did not do any damage, but emigrated in great swarms after having acquired wings, towards the Sierra Nevada, failing, it seems, to cross the mountains.

ODOR IN BUTTERFLIES.—Dr. Fritz Müller read a paper before the London Entomological Society, June 5, 1878, on the peculiar odor emitted by the males of some Brazilian butterflies. Miss Mary E. Murtfeldt calls attention, in the April number of *Psyche*, to the fact that some years before the publication of Dr. Müller's paper she observed, while spreading fresh male specimens of *Calidryas eubule*, a delicate, violet-like odor emitted from the specimens, and which was retained, to some extent, for several days; the females being not at all fragrant.

ENTOMOLOGY AT THE RECENT MEETING OF THE A. A. A. S.—Our report of the meeting of the permanent sub-section of Entomology of the A. A. A. S. is crowded out of this number.

ANTHROPOLOGY.¹

THE INDIANS OF BERKS COUNTY, PA.—In our bibliographical list will be found the complete title of a work upon the Indians of Berks county, Pennsylvania, by Mr. D. B. Brunner. The volume consists of 110 pages of printed matter and 34 plates, containing 176 figures of stone implements and pottery. The people who held this territory when it was visited by the whites were the Delawares, or *Lenni Lenape* (original people), divided into three sub-tribes: the *Unamis*, or Turtles, the *Unalachtgos*, or Turkeys, and the *Minsis*, or Wolves. The Wolf tribe extended over the south-eastern part of Pennsylvania, including Berks county. The greater part of the matter in the volume is of the highest local interest, but there are several sections invaluable to the anthropologist. We notice on page 65 a very sensible and sufficient reason assigned for the Indian massacres and the expulsion of the Delawares from Berks county. Some allusions to aboriginal writing will be found at page 68, to cemeteries on page 73, to collections

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